

# Description

## Stackable Cable Hanger

### BACKGROUND OF INVENTION

[0001] Field of the Invention

[0002] This invention relates generally to devices for supporting cables and, in particular, to hangers for securing cables to support structures.

[0003] Description of Related Art

[0004] Cable hangers are commonly used to secure cables to structural members of, for example, antenna towers and or along tunnel walls. Generally, each cable is attached to a structural member by cable hangers mounted at periodically-spaced attachment points.

[0005] Antenna towers and or tunnels may be crowded due to the multiplicity of cables required for signal-carrying. Over time, as systems are added, upgraded and or expanded, installation of additional cables may be required. To conserve space, it is desirable for each set of cable hangers to secure more than a single cable. Certain cable hangers

have been constructed to secure multiple cables; other cable hangers have a stackable construction that permits multiple cable hangers to be interlocked extending outwardly from each mounting point/structural member. Stacked and multiple-cable-type cable hangers significantly increase the number of cables mountable to a single attachment point.

[0006] Prior vertically stackable multiple cable capable cable hangers, for example as disclosed in US Patent Application Publication US 2004/0061030 by Goodwin et al, required opening of the existing cable hanger to insert an additional cable into an unused cable holding space of the cable hanger. The prior cable hanger incorporated mounting hardware comprising a threaded rod that extended through each additional cable hanger in the vertical stack. Besides a significant materials expense, extending the cable hangers into stacked configurations requires initial installation of longer threaded rod than necessary and or exchange of mounting hardware that momentarily removes support for the existing cables, increasing installation complexity and costs.

[0007] The various single and multiple cable hangers of different capacities necessitate manufacturing, distribution and

storage costs for a family of different hangers and similarly a range of different mounting hardware of varying lengths for each anticipated hanger stack configuration. Competition within the cable hanger market has focused attention on ease of use, reliability, expandability and overall reductions in manufacturing, distribution and installation costs.

[0008] Therefore, it is an object of the invention to provide a device that overcomes deficiencies in the prior art.

#### **BRIEF DESCRIPTION OF DRAWINGS**

[0009] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the invention.

[0010] Figure 1 is a top perspective view of a cable hanger in accordance with the principles of the invention.

[0011] Figure 2 is a bottom perspective view similar to Figure 2.

[0012] Figure 3 is perspective view of the cable hanger of figure 1, in which the shell halves are folded to a closed position.

[0013] Figure 4 is a perspective view similar to figure 3, showing

the cable hanger closed around a cable and secured with typical mounting hardware.

[0014] Figure 5 is a perspective view of a plurality of the cable hangers of figure 3 in a stacked configuration closed around representative cables.

[0015] Figure 6 is a perspective view of a plurality of cable hangers as shown in Figure 5, also with a side stack of hangers attached.

#### **DETAILED DESCRIPTION**

[0016] With reference to Figures 1 and 2, a cable hanger 10 of the invention includes a front shell half 12 and a rear shell half 14 that may be hingeably joined together by one or more spaced-apart assembly hinge(s) 16. The shell halves 12, 14 are folded or closed one onto the other to create an enclosing or encasing structure. When folded, respective front shell half inner surface 20 and rear shell half inner surface 22 of the shell halves 12, 14 have a confronting relationship and respective front shell half outer surface 24 and rear shell half outer surface 26 of the shell halves 12, 14 face away from each other in opposite directions. The assembly hinge(s) 16 may be provided for temporarily coupling the shell halves 12, 14 together for ease of manufacture and or distribution until folding for

assembly and may be frangible. The relative thinness of the assembly hinge(s) 16 relative to the shell halves 12, 14 facilitates the folding of the shell halves 12, 14. Cable hanger 10 is self-locking when the shell halves 12, 14 are folded together, as shown in Figure 3. A releasable snap-interlock means for closure is created, for example, by the interlock between a plurality of closure flange(s) 28 and closure fin(s) 30 of the front shell half 12 that are adapted to mate with and engage corresponding closure flange(s) 28 and closure fin(s) 30 of the rear shell half 14 as the two shell halves 12, 14 are folded together. Closure alignment pin(s) 32 that fit into corresponding closure aperture(s) 34 or the like formed in the shell halves 12, 14 align the respective closure flange(s) 28 with the closure fin(s) 30 and also ensure that the shell halves 12, 14 are aligned together. Thereby, inner surfaces 20, 22 cooperate to surround and secure between them the outer diameter of a desired cable 40 within a cable space 44, as shown in Figure 4.

[0017] The cable 40 may be further retained between the shell halves 12, 14 by a plurality of gripping finger(s) 42 extending into the cable space 44. The gripping finger(s) 42 are adapted to deflect as a cable 40 is inserted into the

cable space 44 and the shell halves 12, 14 snap-interlock together, creating a bias against the cable 40 which creates a secure grip upon a desired standard cable 40 outer diameter. The gripping finger(s) 42 operate to extend a range of acceptable cable 40 outer diameter variability resulting from, for example, different production batches of cable and or different cable manufacturers. Retention of the cable 40 within the cable space 44 may be further and or alternatively enhanced by the addition of rib(s) 48 to the respective inner surfaces 20, 22 of the shell halves 12, 14 and or gripping finger(s) 46, if present. The rib(s) 48 may be, for example, spaced apart in a parallel configuration to coincide with the expected spacing of corrugations formed in an outer conductor of the cable 40.

[0018] With continued reference to Figure 4, when snap interlocked around a cable 40, the cable hanger 10 may be coupled to a mounting surface by mounting hardware such as a nut 50 and bolt 52 or the like. Front shell half bolt hole 54 and rear shell half bolt hole 55 respectively formed in the shell halves 12, 14 align when the cable hanger 10 is folded. A recessed nut surface 56 formed in the front shell half 12 allows the bolt 52, inserted through the bolt hole(s) 54, 55 to be secured via, for example, the

nut 50 without requiring a bolt 52 that extends above the top surface of the cable hanger 10.

[0019] Figures 4 – 6 demonstrate mounting hardware in the form of a ceiling adapter plate 60 with a washer 58 for securing the bolt 52 to the ceiling adapter plate 60 which is in turn mounted to the desired mounting surface. Alternative mounting configurations may include any manner of attachment wherein a bolt 52 or the like is secured to a desired mounting surface and the cable hanger 10 attached in turn to the bolt 52 or the like as described hereinabove.

[0020] Multiple cable hanger(s) 10 may be vertically snap-interlocked together as shown in Figure 5. A releasable snap-interlock means for interlocking between cable hanger(s) 10 is provided, for example, by the engagement between a plurality of interlock flange(s) 62 and interlock fin(s) 64 distributed around a vertical mating surface 63 of the front shell half 12 that are adapted to mate with and engage corresponding interlock flange(s) 62 and interlock fin(s) 64 distributed around the vertical mating surface 63 of the rear shell half 14 as the rear shell half 14 of a cable hanger 10 is lowered upon a front shell half 12 of a base cable hanger 10. Interlock alignment pin(s) 66 that fit into corresponding interlock aperture(s) 68 or the like formed

in the shell halves 12, 14, for example projecting outward from the outer surfaces 24, 26 may be used to align the respective interlock flange(s) 62 with the interlock fin(s) 64 and also ensure that the shell halves 12, 14 are aligned together whereby the longitudinal axis of the cable space(s) 44 of each cable hanger 10 are parallel. Further alignment may be incorporated by recessing a, for example, cylindrical mounting post 70 coaxial with the bolt hole 50 on the front shell half 12 below the vertical mating surface 63 and similarly extending a corresponding mounting post 70 to project beyond the mating surface 63 of the rear shell half 14. Thereby, when vertically snap-interlocked together, the extending mounting post 70 of a rear shell half 14 mates into the recessed area of the corresponding front shell half 12 mounting post 70.

[0021] The outer surfaces 24, 26 of the cable hanger 10 may be reinforced via addition of a reinforcing fin 71 extending from the outer surfaces 24, 26 to their respective vertical mating surface(s) 63. Also, the reinforcing fin 71 may extend laterally to join the cylindrical mounting post(s) 70.

[0022] A cable hanger 10 may also be coupled with a cable hanger 10, side to side through the addition of suitable side interlocking means for latching such as at least one



side latch 72 that mates with a corresponding side aperture 76 in the second cable hanger 10. As shown in figures 1, 2 and 5, the side interlocking means may be formed in a connection side 74 of each cable hanger 10. To allow side to side interconnection of a unitary cable hanger 10 design, the side latch(s) 72 and side aperture(s) 76 are arrayed on the connection side 74 in complementary positions.

[0023] The various closure flange 28 to closure fin 30 and interlock flange 62 to interlock fin 64 pairs are arranged upon the cable hanger 10 clear of the connection side 74 area to allow each to be engaged and or released without interfering with a side attached cable hanger 10. Further, each of the side by side coupled cable hanger(s) 10 may be stacked vertically as described herein above to form a high density cable hanger 10 assembly, as shown for example in Figure 6, requiring only a single attachment point to the desired support structure.

[0024] One skilled in the art will recognize that the interlock flange(s) 62, closure flange(s) 28, side latch(s) 72 and their respective mating fin(s) and or aperture(s) may alternatively be formed in numerous well known alternative configurations having an equivalent effect of securely

snap-interlocking the respective components to each other. Therefore, each of the selected labels used for these elements should be recognized as functionally descriptive for clarity rather than as specific structural limitations to the type of snap-interlocking that may be applied when practicing the various embodiments of the invention. The cable hanger 10 may be cost efficiently formed by injection molding as a unitary structure from a suitable polymer resin, such as conventional thermoset or thermoplastic resins. Suitable injection molding materials include polycarbonate, polypropylene, polyoxymethylene (POM), polybutylene terephthalate (PBT) and acetal copolymer or the like. Depending upon the material used and the intended application, additives such as carbon black for UV protection may be included. For underground and or tunnel applications, non-halogenated fire retardant plastics may be used. In use, a cable 40 is positioned within one of the inner surfaces 20, 22 and the shell halves 12, 14 folded towards each other along the assembly hinge(s) 16, 18 to surround the cable 40 within the cable area 44. As the shell halves 12, 14 close upon each other, spring finger(s), if present, are deflected against the cable 40, creating a bias against and thereby gripping the

cable 40 securely, the various guide surfaces engage to ensure alignment between the shell halves 12, 14 and the closure flange(s) 28 and closure fin(s) 30 snap-interlock with each other. The cable hanger 10 may then be secured by mounting hardware to a desired mounting point, for example via a bolt 52 or the like which is, for example, inserted through the bolt hole(s) 54, 55 and secured with a nut 50 tightened against the recessed nut surface 56.

[0025] Once a single cable hanger 10 has been secured, additional cable hanger(s) 10 may be vertically or connection side 74 to connection side 74 snap interlocked as described herein. Because the base cable hanger 10 is secured using a single set of mounting hardware coupled only to the base cable hanger 10, further cable hanger(s) 10 may be added without disassembly or changing out of the mounting hardware. Therefore, to install a single cable hanger, a multiple cable hanger assembly, or to add additional cable 40 carrying capacity to an existing cable hanger 10 installation over time only a single type of cable hanger 10 is required. Further, only a single type of mounting hardware needs to be distributed with the cable hangers independent of the number of cable hangers that may be installed originally and over time as the number of

required cables changes. Still further, installation of additional cable hanger(s) 10 to an existing installation is simplified because the existing cable hanger(s) 10 need not be released even momentarily.

[0026] From the foregoing, it will be apparent that the present invention brings to the art an expandable cable mounting solution having improved performance, ease of installation and significant manufacturing and installation cost efficiencies.

[0027] Table of Parts

10	cable hanger
12	front shell half
14	rear shell half
16	assembly hinge
20	front shell half inner surface
22	rear shell half inner surface
24	front shell half outer surface
26	rear shell half outer surface
28	closure flange
30	closure fin
32	closure alignment pin
34	closure aperture
40	cable
42	gripping finger

44	cable space
48	rib
50	nut
50A	nut (adapter plate)
52	bolt
54	front shell half bolt hole
55	rear shell half bolt hole
56	recessed nut surface
58	washer
60	ceiling adapter plate
62	interlock flange
63	vertical mating surface
64	interlock fin
66	interlock alignment pin
68	interlock alignment aperture
70	mounting post
71	reinforcing fin
72	side latch
74	connection side
76	side aperture

[0028] Where in the foregoing description reference has been made to ratios, integers, components or modules having known equivalents then such equivalents are herein incor-

porated as if individually set forth.

[0029] While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus, methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departure from the spirit or scope of applicant's general inventive concept. Further, it is to be appreciated that improvements and/or modifications may be made thereto without departing from the scope or spirit of the present invention as defined by the following claims.